CLAIMS

1.   An image processing apparatus, comprising:

a distribution data generation means for

5 generating distribution data indicating a distribution of

pixel data for a plurality of pixel data indicating pre-

regulated pixel values in the first range and composing

first image data obtained by taking a picture of a

subject;

10   a specifying means for specifying a second

range to be binarized in the first range based on the

distribution data generated by the distribution data

generation means;

a mapping means for mapping pixel data in the

15 second range specified by the specifying means among a

plurality of pixel data to the first range, and generates

second image data composed of the mapped pixel data; and

a binarization means for binarizing the

second image data generated by the mapping means based on

20 a threshold value regulated in the first range to

generate a third image data.

2.   An image processing apparatus as set forth in

claim 1, wherein said distribution data generation means

generates a distribution data indicating the number of

25 pixel data having pixel values for the respective pixel

values in the first range;

and said specifying means specifies as the second

range a range having pixel values which is maximum pixel

value or less among predetermined number of the pixel

5   data within the first range.

3.   An image processing apparatus as set forth in

claim 1, further comprising a noise removing filter means

for generating a fourth image data by performing edge

enhancement processing after noise removing processing on

10   the second image data generated by the mapping means,

wherein the binarization means binaries the fourth

image data generated by the noise removing filter means

based on a threshold value regulated in the first range

to generate the third image data.

15   4. An image processing apparatus as set forth in

claim 3, wherein said noise removing filter means

generates the fourth image data by performing Gaussian

Laplacian filter for the edge enhancement

processing ,after performing Gaussian filter for the

20   noise removing processing on the second image data

generated by the mapping means.

5. An image processing apparatus as set forth in

claim 4, wherein said noise removing filter means

generates the fourth image data by performing any one

25   processing among Gaussian filter, maximum value filter,

minimum value filter, two-dimensional adaptive noise

removing filter, proximity filter, averaging filter,

Gaussian low-pass filter, two-dimensional Laplacian

proximity filter, or Gaussian Laplacian filter for noise

5 removing processing based on the second image data

generated by the mapping means.

6. An image processing apparatus as set forth in

claim 1, further comprising a filter processing means for

generating a fifth image data by performing filter

10 processing to leave a linear pattern based on the second

image data generated by the mapping means,

wherein the binarization means binaries the fifth

image data generated by the filter processing means based

on a threshold value regulated in the first range to

15 generate the third image data.

7. An image processing apparatus as set forth in

claim 6, wherein said filter processing means specifies

the fifth image data of low frequency components compared

with the threshold value to leave a linear pattern by

20 frequency components in the two-dimensional Fourier space

obtained by performing two-dimensional Fourier transform

processing on the second image data generated by the

mapping means.

8. An image processing apparatus, comprising:

25 a first processing means for indicating a

pixel value and using as a pixel data the minimum pixel

data in the first region around the pixel data, for each

of a plurality of pixel data composing the first image

data obtained by a taking a picture of a subject; and

5   a second processing means for generating a

second image data by using as the pixel data the maximum

pixel data among pixel data in the second region larger

than the first region around the pixel data for each of

image data by the first processing means.

10   9.   An image processing apparatus as set forth in

claim 8, further comprising a third processing means for

generating a third image data by using as a pixel data

the minimum pixel data in the second region around the

pixel data, for each of pixel data composing the second

15   image data generated by the second processing means.

        10.   An image processing apparatus as set forth in

claim 8, further comprising a fourth processing means for

using as a pixel data the maximum pixel data in the among

pixel data in the first region around the pixel data, for

20   each of pixel data generated by the first processing

means,

        wherein the second processing means generates

the second image data by using as a pixel data the

maximum pixel data among pixel data in the second region

25   being larger than the first region around the pixel data

by the forth processing means.

11.   An image processing method, including:

a first step for generating distribution data indicating a distribution of pixel data for a plurality

5   of pixel data indicating pre-regulated pixel values in the first range and composing first image data obtained by taking a picture of a subject;

a second step for specifying a second range to be binarized in the first range based on the

10   distribution data generated by the first step;

a third step for mapping pixel data in the second range specified by the second step among a plurality of pixel data to the first range, and generates second image data composed of the mapped pixel data; and

15   a forth step for binarizing the second image data generated by the fourth step based on a threshold value regulated in the first range to generate a third image data.

12.   An image processing method as set fourth in

20   claim 11, wherein said first step generates the distribution data indicating the number of pixel data having pixel values for respective pixel values in the first range;

and said second step specifies as the second range

25   a range having pixel data which is maximum pixel value or

less among a predetermined number of the pixel data

within the first range as the second range to be

binarized.

13. An image processing method as set forth in

5 claim 12, further comprising a fifth step of generating

forth image data by performing edge enhancement

processing after performing noise removing processing

based on the second image data generated by the third

step,

10 wherein the fourth step generated by the fifth step

on a threshold value regulated in the first range to

generate the fourth image data.

14. An image processing method as set forth in

claim 15, wherein said fifth step generates the fourth

15 image data by performing Gaussian Laplacian filter for

the edge enhancement processing after performing Gaussian

filter for the noise removing processing on the second

image data generated by the third step.

15. An image processing method as set forth in

20 claim 13, wherein said fifth step generates the fourth

image data by performing any processing among a plurality

of different noise removing processing based on the

second image data generated by the third step.

16. An image processing method as set forth in

25 claim 15, wherein said fifth step generates the fourth

image data by performing any one processing among

Gaussian filter, maximum value filter, minimum value

filter, two-dimensional adaptive noise removing filter,

proximity filter, averaging filter, Gaussian low-pass

5   filter, two-dimensional Laplacian proximity filter, or

Gaussian Laplacian filter for noise removing processing

on the second image data generated by the third step.

17.   An image processing method as set forth in

claim 11, further comprising a sixth step for generates

10   the fifth image data by performing filter processing to

leave a linear pattern based on the second image data

generated by the third step,

wherein the forth step binaries the fifth image

data generated by the sixth step based on a threshold

15   value regulated in the first rage to generate the third

image data.

18.   An image processing method as set forth in

claim 17, wherein said sixth step specifies the fifth

image data of low frequency components compared with the

20   threshold value to leave a linear pattern by frequency

components in the two-dimensional Fourier space obtained

by performing two-dimensional Fourier transform

processing on the second image data generated by the

third step, and

25   the forth step binaries the fifth image data

specified by the sixth step on a threshold value

regulated in the first range to generate the third image.

19.   An image processing method as forth in claim

18, wherein said sixth step specifies the sixth image

5   data of low frequency components comparing with the

threshold value larger than the threshold value by

frequency components in the two-dimensional Fourier space

obtained by performing two-dimensional Fourier transform

processing on the image data generated by the third step.

10   20.   An image processing method, including:

a first step for indicating a pixel value and

using as a pixel data the minimum pixel data in the first

region around the pixel data, for each of a plurality of

pixel data composing the image data obtained by a taking

15   a picture of a subject; and

a second step for generating a second image

data by using as the pixel data the maximum pixel data

among pixel data in the second region being larger than

the first region around the pixel data for each of image

20   data by the first step.

21.   An image processing method as forth in claim

20, further comprising a third step for generating a

third image data by using as a pixel data the minimum

pixel data in the second region around the pixel data,

25   for each of pixel data composing the second image data

generated by the second step.

22.   An image processing method as forth in claim 20, further comprising a fourth step for using as a pixel data the maximum pixel data in the among pixel data in the first region around the pixel data, for each of pixel data generated by the first step,

wherein the second step generates the second image data by using as a pixel data the maximum pixel data among pixel data in the second region being larger than the first region around the pixel data by the forth step.

23.   An image processing method as forth in claim 20, further comprising a fifth step for generates the fourth image data by performing filter processing for leaving a linear pattern based on the second image data generated by the second step.

24.   An image processing method as forth in claim 23, wherein said fifth step processing means specifies low frequency components comparing with the threshold value to leave a linear pattern by frequency components in the two-dimensional Fourier space obtained by performing two-dimensional Fourier transform processing on the image data generated by the second step.

25.   An image processing method as forth in claim 24, wherein said fifth step specifies the second image data of low frequency components comparing with the

threshold value larger than the threshold value by

frequency components in the two-dimensional Fourier space

obtained by performing two-dimensional Fourier transform

processing on the image data generated by the second step.